

# RECLAMATION

*Managing Water in the West*

## **Arkansas Valley Conduit and Long-Term Excess Capacity Master Contract**

### **FINAL ENVIRONMENTAL IMPACT STATEMENT**

#### **EXECUTIVE SUMMARY**

*Prepared by*

United States Department of the Interior  
Bureau of Reclamation  
Great Plains Region  
Eastern Colorado Area Office



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## MISSION STATEMENTS



The U.S. Department of the Interior protects America's natural resources and heritage, honors our cultures and tribal communities, and supplies the energy to power our future.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

# Executive Summary

Currently, the Lower Arkansas River Basin communities in southeastern Colorado use groundwater wells to supply most of their drinking water. Now, that supply is in question, as more and more towns find that their groundwater contains cancer-causing radioactive contaminants such as naturally occurring radium and uranium. Fourteen water providers are currently under orders by the Colorado Department of Public Health and Environment (Health Department) to remove the radioactivity using expensive treatment technology or to find a better quality water source.

Additionally, dissolved salts in the Lower Arkansas River Basin groundwater, although not a public health threat, cause taste and odor issues and burden residents with higher maintenance and replacement costs when using water-based appliances such as dishwashers and water heaters. For example, the useful life of a water heater is typically about 10 years, but can be lower if the water contains salts that are above the U.S. Environmental Protection Agency (EPA) recommended level of 500 milligrams per liter (mg/L). The level of salts in Lower Arkansas River groundwater is typically much higher.

Simply replacing contaminated groundwater supplies with surface water from the Arkansas River is problematic because the river is also contaminated with high levels of selenium, sulfates, uranium, and salts. Lower Arkansas River Basin water providers have worked for years with the Health Department to resolve water quality challenges and have committed to find an alternative water supply as part of a long-term solution. Along with obtaining clean water supplies, water providers need to reliably manage and deliver it. To meet these needs, the U.S. Department of the Interior, Bureau of Reclamation (Reclamation), has proposed three federal actions.

- Building the Arkansas Valley Conduit (AVC), which was originally proposed as part of the Fryingpan-Arkansas (Fry-Ark) Project
- Allowing water providers to use a pipeline connecting the Pueblo Dam north and south outlet works (Interconnect)
- Allowing use of available storage space (excess capacity) in Pueblo Reservoir (Master Contract) when the reservoir is not filled to capacity with Fry-Ark water

These proposed actions would deliver high quality water to water providers that meets EPA and state water quality requirements and recommendations, and would help water providers throughout the Arkansas River Basin reliably meet existing and future water demands. This Final Environmental Impact Statement (EIS) discloses potential environmental consequences associated with the three proposed actions.



*Pueblo Reservoir would be a source of safe and clean water for the Lower Arkansas River Basin.*



*1 acre-foot (ac-ft) equals 325,851 gallons. 1 ac-ft is approximately the size of a football field filled with water 1 foot deep, and meets the needs of a family of 4 for about 1 year.*

## Authorization and History

Reclamation is the lead federal agency for preparation of this Final EIS. All proposed actions would be part of, or use features of, the Fry-Ark Project, which is owned and operated by Reclamation.

Several federal, state, and local agencies participated in preparing the Draft and Final

EIS as cooperating agencies. The Southeastern Colorado Water Conservancy District (Southeastern) is a cooperating agency and has an administrative role that would include being the local contracting agency responsible

for repayment of locally funded construction costs of the AVC and Interconnect, and working with Fry-Ark beneficiaries.



Photo Courtesy of Colorado State University.

*Pueblo Dam construction in the 1970s.*

The Fry-Ark Project is a multipurpose, transbasin water diversion and delivery project in Colorado, built between 1964 and the mid-1980s by the federal government. It annually diverts an average of 48,500 acre-feet (ac-ft) of water from the Fryingpan River and other tributaries of the Roaring Fork River on the West Slope of the Rocky Mountains to the Arkansas River Basin on the East Slope. West Slope imports are stored on the East Slope in Turquoise Lake, Twin Lakes, and Pueblo Reservoir. The Fry-Ark Project reservoirs also store Arkansas River Basin water that is primarily available during wet years, and other non-Fry-Ark water supplies through contracts with water users. Fry-Ark yield is a supplemental supply for municipal, industrial, and irrigation use in the Arkansas River Basin of Colorado.

AVC was authorized by Congress in the original Fry-Ark legislation in 1962 (Public Law 87-590). AVC would not increase Fry-Ark Project water diversions from the West Slope; rather it was intended to improve drinking water quality. However, AVC was not constructed with the original project primarily because of the beneficiaries' inability to repay construction costs. In 2009, Congress amended the original Fry-Ark legislation in Public Law 111-11, which authorized annual federal funding, as necessary, for constructing AVC, and included a cost sharing plan with 65 percent federal and 35 percent local funding. The locally funded portion of AVC and the Interconnect would be repaid by Southeastern to the federal government over a period of 50 years. Annual storage costs charged by Reclamation under the Master Contract would be paid entirely by water providers participating in these contracts.

## Revisions Included in the Final Environmental Impact Statement

The Draft EIS was released for public review in August 2012. Reclamation solicited comments from the public, agencies, and interested parties during the 60-day comment period that ended October 30, 2012. During the comment period, Reclamation held five public hearings from September 24 to 27 in Salida, Pueblo, La Junta, and Lamar to inform people about the proposed actions and to solicit verbal or written public comments on the Draft EIS. Reclamation received a total of 27 letters and e-mails in addition to oral comments at the five public hearings. A total of 200 comments were recorded. Comments were received from reviewing state and federal agencies, organizations, and interested and potentially affected members of the public.

The Final EIS includes revisions based on response to substantive comments on the Draft EIS regarding alternative actions and environmental impacts. In addition, new information became available since completion of the Draft EIS, and analyses relevant to environmental concerns and issues were revised or clarified. The Comanche South Alternative evaluated in the Draft EIS was revised in response to public comments and to reduce resource effects and cost. Reclamation evaluated all of the alternatives based on key criteria to identify a preferred alternative. Reclamation addressed substantive comments received on the Draft EIS in the revised text of the Final EIS or appendixes and in the response to comments (Appendix P).

Primary changes from the Draft EIS include the following:

- The Comanche South Alternative's AVC alignment and water treatment plant location were revised. The alternative was renamed Comanche North to reflect alignment changes and to maintain consistency with alternative naming conventions. The Comanche North Alternative includes use of the existing Joint Use Pipeline (JUP) and an expanded and integrated operation with Board of Water Works of Pueblo's Whitlock Water Treatment Plant (Chapter 2, Appendix B.1). The Comanche North Alternative also has smaller pipeline sizes (diameter) to meet maximum month demands rather than peak day demands.

### *Cooperating Agencies*

*Bent County*

*Board of Water Works of Pueblo*

*City of Pueblo*

*Colorado Department of Natural Resources*

*Colorado Department of Transportation*

*Colorado Division of Water Resources*

*Colorado Division of Parks and Wildlife*

*Fountain Creek Watershed and Flood  
Control District*

*Kansas Division of Water Resources*

*Lower Arkansas Valley Water  
Conservancy District*

*Otero County*

*Prowers County*

*Pueblo County*

*Southeastern Colorado Water  
Conservancy District*

*U.S. Army Corps of Engineers*

*U.S. Environmental Protection Agency*

*U.S. Fish and Wildlife Service*



*Reclamation solicited comments on the Draft EIS during several public hearings.*

- A preferred alternative was identified (Chapter 2).
- Mitigation for moderate resource effects was revised in response to cooperating agency and public comments (Chapter 4, Appendix B.5).
- Southeastern prepared the Final Regional Water Conservation Plan (Appendix B.7).
- The Arkansas River Compact description was revised in consultation with the states of Kansas and Colorado (Chapter 3, Chapter 4, Appendix D.3)

- Floods and water quality effects analyses were updated using new information (Chapter 4, Appendix F.1, Appendix F.2).
- Discussion of effects on West Slope streamflow was expanded (Appendix D.5).
- Effects on the Santa Fe National Historical Trail were clarified (Chapter 4).
- In consultation with the Colorado State Historic Preservation Office, National Park Service, and other consulting parties, Reclamation prepared a National Historic Preservation Act Section 106 Programmatic Agreement to address potential impacts to historic properties (Appendix N).
- Reclamation submitted a Biological Assessment to the U.S. Fish and Wildlife Service (Appendix O).
- Reclamation responded to substantive Draft EIS public comments (Appendix P).

## Proposed Actions

Three proposed federal actions by Reclamation are analyzed in this Final EIS: (1) constructing and operating AVC, (2) entering into a conveyance contract with various water providers for use of the Interconnect between Pueblo Dam's north and south outlet works, which could be constructed as part of AVC, and (3) entering into a Master Contract with Southeastern to store water in Pueblo Reservoir (**Table 1**). While serving similar water supply and delivery purposes, the proposed actions are independent of each other.

**Table 1. Proposed Federal Actions**

PROPOSED ACTION	PURPOSE	WATER PROVIDERS	RECLAMATION CONTRACT
AVC construction and operation	Bulk water supply pipeline and related facilities for municipal and industrial water delivery	Southeastern (or a duly authorized Enterprise) and forty AVC participants within Southeastern's boundaries	AVC Repayment, Operation and Maintenance, and Conveyance Contract: 50 years
Issuance of a Pueblo Dam North and South Outlet Works Interconnect Long-Term Conveyance Contract to water providers	Construction of a pipeline connection as part of AVC to allow flexibility in delivery of water between the north or south outlets, if either outlet is temporarily shut down	AVC water providers, Board of Water Works of Pueblo, Pueblo West, Southern Delivery System water providers, and Fountain Valley Authority within Southeastern's boundaries	Pueblo Dam North-South Outlet Works Interconnect Conveyance Contract: 40 years
Issuance of a Long-Term Excess Capacity Master Contract to Southeastern	Long-term excess capacity storage in Pueblo Reservoir to improve water supply	Twenty-five AVC water providers and twelve other water providers within Southeastern's boundaries	Long-Term Excess Capacity Master Contract: 40 years

### **Arkansas Valley Conduit Construction**

AVC would be a water supply pipeline that would help meet existing and future municipal and industrial water demands of water providers in the Arkansas River Basin. Physical features would include constructing over 200 miles of buried pipeline, a water treatment facility, and other related facilities. Forty towns and rural domestic water supply systems within Southeastern boundaries located in Pueblo, Crowley, Otero, Bent, Prowers, and Kiowa counties (population 74,255) would participate in AVC. Water providers are requesting water deliveries of 10,256 ac-ft to help meet 2070 water demands (**Table 2**). AVC water treatment would include filtering, which would require the water provider to add disinfectant, or filtering and disinfection. AVC water would not be used for agricultural irrigation because such use is not a congressionally authorized purpose for AVC.



*The AVC would be a buried pipeline, similar to the one shown in this photo, which would convey water from Pueblo Reservoir east to Lamar or from a river intake below Pueblo Dam.*

**Table 2. AVC Water Providers and Requested Water Deliveries for 2070**

AVC WATER PROVIDER	ANNUAL AVC DELIVERIES (AC-FT)	AVC WATER PROVIDER	ANNUAL AVC DELIVERIES (AC-FT)
<b>Pueblo County</b>		<b>Otero County (continued)</b>	
Avondale	164	East End Water Association	13
Boone	94	Eureka Water Company	86
St. Charles Mesa Water District	2,651	Fayette Water Association	14
<b>Crowley County</b>		Fowler	220
96 Pipeline Company	27	Hancock, Inc.	18
Crowley County Water Association	617	Hilltop Water Company	40
Crowley	51	Holbrook Center Soft Water	22
Olney Springs	59	Homestead Improvement Association	9
Ordway	366	La Junta	2,299
Sugar City	127	Manzanola	50
<b>Bent County</b>		Newdale-Grand Valley Water Company	60
Hasty Water Company	33	North Holbrook Water	8
Las Animas	602	Patterson Valley	17
McClave Water Association	59	Rocky Ford	576
<b>Prowers County</b>		South Side Water Association	5
Lamar	1,241	South Swink Water Company	92
May Valley Water Association	222	Swink	49
Wiley	28	Valley Water Company	39
<b>Kiowa County</b>		Vroman	37
Eads	116	West Grand Valley Water, Inc.	15
<b>Otero County</b>		West Holbrook Water	9
Beehive Water Association	10	<b>Total: 10,256 ac-ft</b>	
Bents Fort Water Company	81		
Cheraw	30		



### ***Pueblo Dam North-South Outlet Works Interconnect Conveyance Contract***

During short-term maintenance and emergency situations, the Interconnect would move water between the north and south outlet works at Pueblo Reservoir. The Interconnect would be a short section of pipeline to be constructed as part of AVC between the two outlet works. Interconnect operations would require a long-term (40-year) contract between Reclamation and the Interconnect water providers for use during periodic maintenance or emergencies activities. The Interconnect contract would also support partial deliveries of water to water connections at Pueblo Reservoir for the AVC, Pueblo Fish Hatchery, Board of Water Works of Pueblo, Pueblo West Metropolitan District, Southern Delivery System, and Fountain Valley Authority.

### ***Master Contract***

The Master Contract would allow use of extra storage space in Pueblo Reservoir when this space is not filled with Fry-Ark water. Storage of non-Fry-Ark water in Pueblo Reservoir would be subject to existing Reclamation contract rules. Southeastern could then subcontract with the participating water providers to divide the requested storage space, as shown in **Table 3**. The water providers in the Master Contract are all located within Southeastern boundaries. Some AVC water providers are also participating in the Master Contract and would store non-Fry-Ark water for delivery through AVC. Non-AVC water providers would use existing water systems or the Arkansas River to receive their Master Contract water deliveries.



*The Interconnect pipeline would connect the Pueblo Reservoir south outlet works manifold to the north outlet works shown here.*



*The Master Contract would allow storage of non-Fry-Ark water within available storage space in Pueblo Reservoir.*

**Table 3. Master Contract Water Providers and Requested Storage**

WATER PROVIDER <sup>(1)</sup>	STORAGE REQUEST (AC-FT)	WATER PROVIDER <sup>(1)</sup>	STORAGE REQUEST (AC-FT)
<b>Chaffee County</b>		<b>Otero County</b>	
Poncha Springs	200	<i>Beehive Water Association</i>	18
Salida	2,000	<i>Bents Fort Water Company</i>	10
Upper Arkansas Water Conservation District	1,000	<i>Fayette Water Association</i>	16
<b>Fremont County</b>		<i>Fowler</i>	50
Cañon City	1,000	<i>Hilltop Water Company</i>	35
Florence	2,250	<i>Holbrook Center Soft Water</i>	12
Penrose	900	<i>Homestead Improvement Association</i>	6
<b>El Paso County</b>		<i>La Junta</i>	2,000
Fountain	1,000	Lower Arkansas Valley Water Conservation District	5,000
Security	1,500	<i>Manzanola</i>	60
Stratmoor Hills	200	<i>Newdale-Grand Valley Water Company</i>	50
Widefield	650	<i>Patterson Valley</i>	40
<b>Pueblo County</b>		<i>Rocky Ford</i>	1,200
Pueblo West	6,000	<i>South Side Water Association</i>	8
<i>St. Charles Mesa Water District</i>	2,000	<i>South Swink Water Company</i>	80
<b>Crowley County</b>		<i>Valley Water Company</i>	47
<i>96 Pipeline Company</i>	25	<i>Vroman</i>	41
<i>Crowley County Water Association</i>	1,000	<i>West Grand Valley Water, Inc.</i>	15
<i>Olney Springs</i>	125	<b>Bent County</b>	
<i>Ordway</i>	750	<i>Las Animas</i>	300
<b>Kiowa County</b>		<b>Prowers County</b>	
<i>Eads</i>	50	<i>May Valley Water Association</i>	300
		<b>Total: 29,938 ac-ft</b>	

Notes:

<sup>(1)</sup> Water providers in italics are participating in both AVC and Master Contract.

## Purpose and Need

Each proposed federal action has a specific purpose and associated water provider need:

- The purpose of AVC is to deliver water for municipal and industrial water use within Southeastern's boundaries. This water supply is needed to supplement or replace existing poor quality water and to help meet AVC water providers' projected water demands through 2070 (the term of the contract).
- The purpose of the Interconnect is to provide a backup Pueblo Dam outlet to participating water provider delivery systems. The Interconnect contract is needed through 2060 (the term of the contract) to move water during short-term disruption of service from either the north or south outlet works at Pueblo Reservoir by transferring water to the working outlet.



*Water supplies in the Lower Arkansas River Basin cannot meet drinking water standards without advanced treatment.*

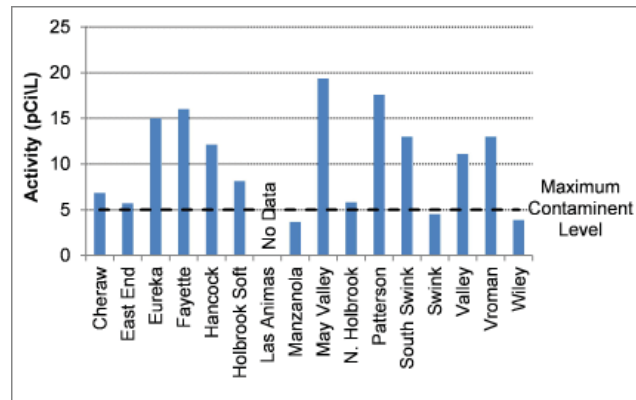
- The purpose of the Master Contract is to allow water providers within Southeastern's boundaries to store water in unused storage space in Pueblo Reservoir. A long-term storage contract provides surety and convenience not found in a short-term contract. The Master Contract secures a reliable water supply for water providers to help meet projected demand through 2060 (the term of the contract).

### Need for Arkansas Valley Conduit

Fourteen AVC water providers currently use water supplies contaminated with naturally occurring radioactive material in concentrations that are above primary drinking water standards (**Figure 1**). The Health Department has notified these water providers (via enforcement actions) that they must treat water supplies to remove radioactivity or find a better quality water source. Seven additional AVC water providers have elevated levels of natural radioactivity, but do not currently violate Health Department standards. Long-term exposure to radioactivity that exceeds primary drinking water standards could increase the risk of cancer.

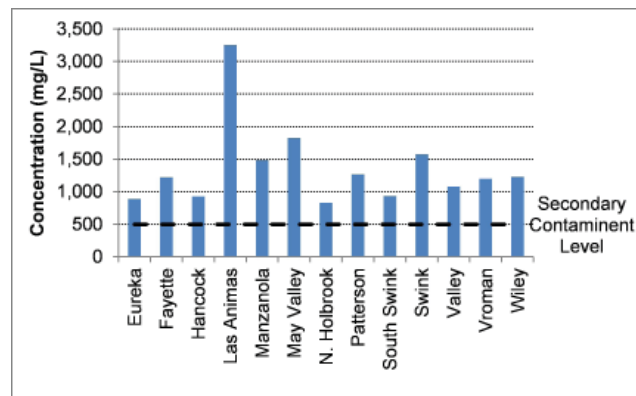
AVC water providers also generally have difficulties meeting nonmandatory secondary drinking water standards for salts and sulfate (**Figure 2**). The median salts concentration over the past 40 years has been about 3,400 mg/L in lower Arkansas River Basin groundwater (Miller et al. 2010), which is nearly seven times greater than the secondary drinking water standard. Some AVC water providers also are not meeting the secondary drinking water standard for iron. Like radionuclides, salts and sulfate are not removed by conventional water treatment methods.

AVC water providers also have a need to meet future water demands. Estimated future (2070) AVC water provider demand is 12,569 ac-ft (**Figure 3**). Future demand was estimated by applying projected population growth rates to future per capita water use rates – which were reduced from current per capita water use rates based on estimated water conservation savings.



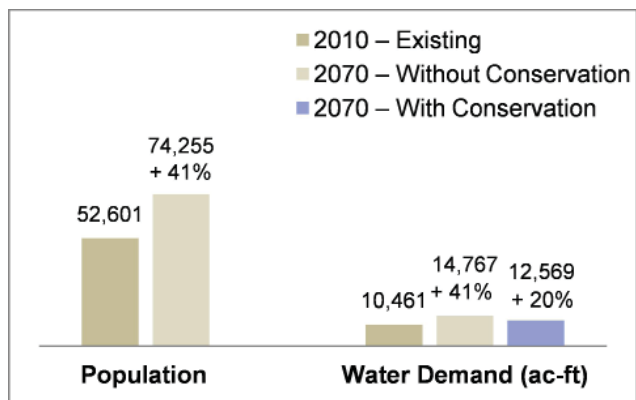
Data Source: Malcolm Pirnie 2009b, EPA 2012

**Figure 1. Average Combined Radium Concentration for Select AVC Water Providers**



Data Source: Malcolm Pirnie 2009b

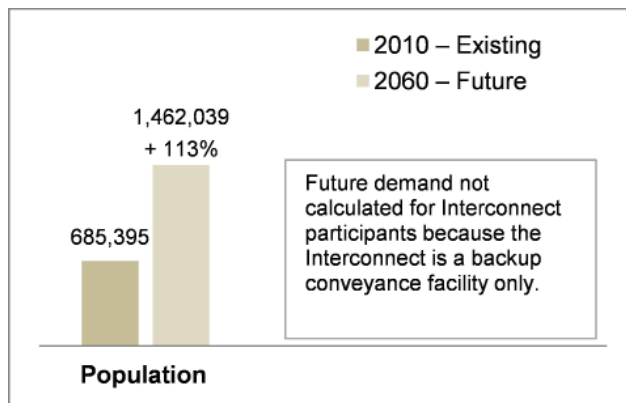
**Figure 2. Salts Concentrations for Select AVC Water Providers**



**Figure 3. Population and Water Demand in 2010 and 2070 for AVC Water Providers**

### Need for Interconnect

Interconnect water providers need a backup system between the north and south outlet works of Pueblo Reservoir to serve about 1.5 million people in the future (**Figure 4**). Municipal and industrial



**Figure 4. Population in 2010 and 2060 for Interconnect Water Providers**

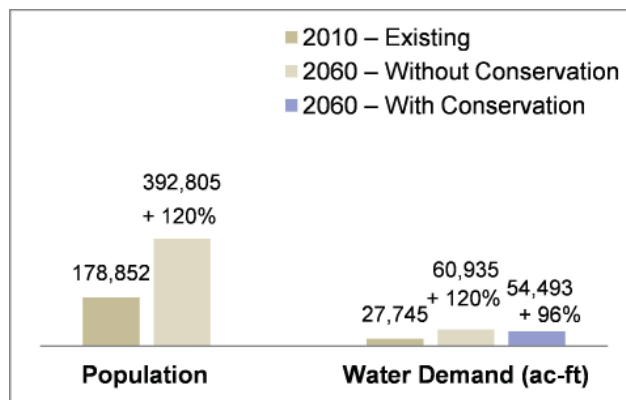
water providers are vulnerable to any outlet works outage (for example, during maintenance) because these outages often disrupt service to customers. Need for the Interconnect includes the following.

- Prevent disruption of water service from short or long outages, depending on internal system storage varying from a few days to weeks.
- Improve water quality and reduce operational costs during outlet works maintenance and emergency activities for water providers with backup river diversions.
- Prevent disruptions of water delivery to the Pueblo Fish Hatchery during fish rearing.

If a short-term outage of either outlet occurs, the Interconnect would allow participating water providers to receive water from Pueblo Reservoir through the other working outlet.

### Need for Master Contract

For Master Contract water providers not participating in AVC, demand is projected to increase to 54,493 ac-ft by 2060 (**Figure 5**). Although some Master Contract water providers have sufficient supplies to meet future demands on an annual basis, the



**Figure 5. Population and Water Demand in 2010 and 2060 for Master Contract Water Providers**

Master Contract is needed to fulfill demand in winter months when streamflow is low. Other water providers have sufficient senior water rights to supply future average annual demands, but are requesting the Master Contract to store water for use in drought and emergency situations. The Lower Arkansas Valley Water Conservancy District would also use Master Contract storage space for agricultural water use.



## Alternatives

Alternatives were developed using a structured alternative development and screening process. The goal of this process was to identify a range of reasonable alternatives to meet the purpose and needs of the AVC, Interconnect contract, and Master Contract. National Environmental Policy Act (NEPA) regulations require analysis of a No Action Alternative (the future without the proposed actions) to serve as a basis of comparison to other action alternatives.

In conjunction with the AVC EIS, Reclamation conducted an appraisal study for the EIS alternatives (Reclamation 2012a, 2013a). The Appraisal Design Report prepared construction and operating, maintenance, and replacement (OM&R) cost estimates for planning, evaluating, and comparing alternatives and their features (**Table 4**).

Cost estimates for alternatives with AVC include a new water treatment plant. The plant would meet Health Department requirements by delivering filtered water, which would require additional disinfection at each water provider's delivery point, or by delivering filtered and disinfected water, which is fully treated water, to the water providers (Health Department 2011). Some alternatives would provide untreated water to St. Charles Mesa Water District to be treated by the water provider.

*Seven alternatives were identified for evaluation in this EIS:*

- *No Action*
- *Comanche North*
- *Pueblo Dam South*
- *JUP North*
- *Pueblo Dam North*
- *River South*
- *Master Contract Only*

**Table 4. Estimated Costs of Alternatives**

COST DESCRIPTION	COSTS (\$ MILLION) <sup>(1)(2)</sup>						
	NO ACTION	COMANCHE NORTH	PUEBLO DAM SOUTH	JUP NORTH	PUEBLO DAM NORTH	RIVER SOUTH	MASTER CONTRACT ONLY
Construction <sup>(3)</sup>	192	400	495	495	505	475	192
Annual OM&R <sup>(3)</sup>	5.0	3.5	3.4	3.8	3.8	4.2	5.0
Annual Master Contract <sup>(4)</sup>	0.1 - 0.2	0.8 - 1.1	0.8 - 1.1	0.1 - 0.2	0.8 - 1.1	0.8 - 1.1	0.8 - 1.1

Notes:

<sup>(1)</sup> These cost estimates are not suitable for construction funding appropriations from Congress.

<sup>(2)</sup> Costs are in 2011 dollars.

<sup>(3)</sup> Construction and OM&R costs for Comanche North, Pueblo Dam South, JUP North, Pueblo Dam North, and River South costs from appraisal design reports (Reclamation 2012a, 2013a). Construction and OM&R costs for No Action and Master Contract Only alternatives from Appendix B.3.

<sup>(4)</sup> Master Contract costs are described in Appendix B.6. Table presents range of costs.



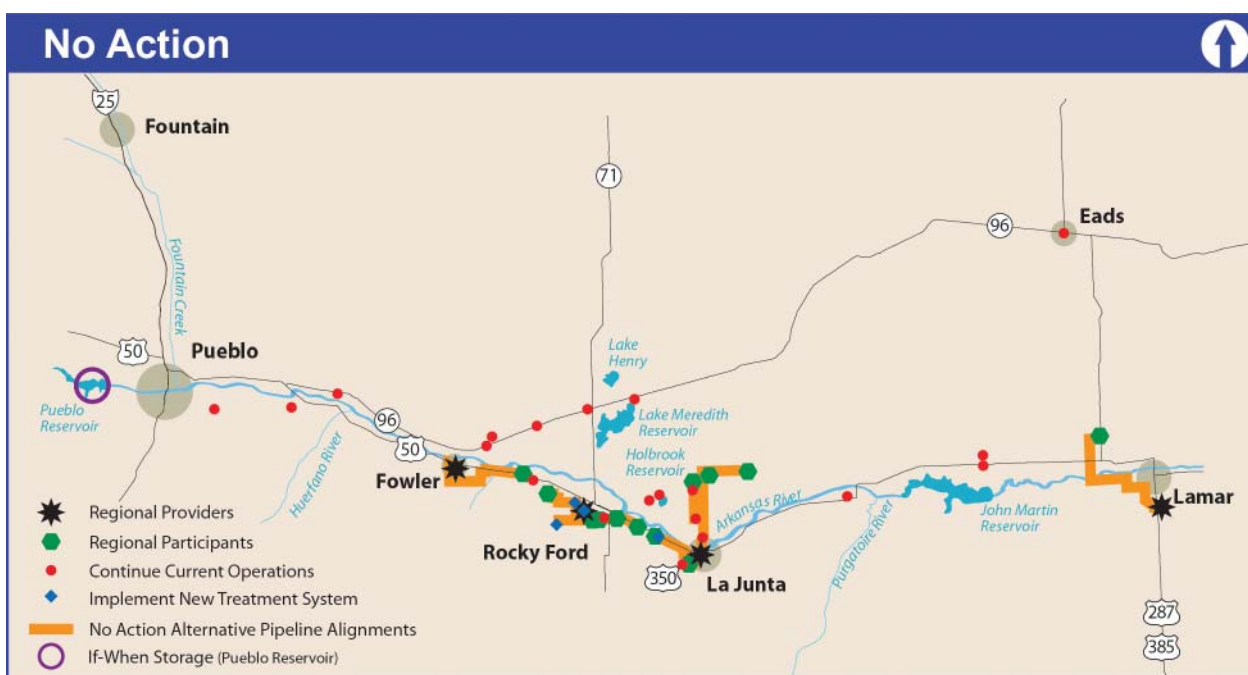
*La Junta (regional provider) reverse osmosis water treatment facility.*

## No Action Alternative

If AVC is not built, AVC water providers would likely meet water quality and water supply needs with a combination of regional and local independent water treatment systems (**Figure 6**). Regional systems are combinations of smaller water providers who would be served by a larger neighboring provider's water treatment plant, share existing and possible new water rights, and construct new pipelines connecting these systems. Local independent systems would include water providers with the ability to meet primary drinking water standards and who are not regional system providers. The No Action Alternative was developed to meet primary drinking water standards, address enforcement actions using surface and groundwater supplies, and meet full 2070 demands. The No Action Alternative may or may not meet secondary drinking water standards because secondary drinking water standards are nonmandatory standards.

Most Interconnect water providers would use existing systems; no new infrastructure would be built to provide a system backup under No Action.

Master Contract water providers would continue current operations without storage or continue applying for temporary excess capacity (If-When storage) contracts with Reclamation to store non-Fry-Ark water in Pueblo Reservoir. The No Action Alternative assumes that no new infrastructure would be built to store water because new reservoirs are speculative at this point.



**Figure 6. No Action Alternative**

## Comanche North Alternative

The Comanche North Alternative includes constructing the AVC and Interconnect, and issuing the Master Contract to store water in Pueblo Reservoir (**Figure 7**). Water would be diverted from Pueblo Reservoir through the south outlet works and delivered through the existing JUP immediately upstream from Pueblo Boulevard north of the Arkansas River. AVC would use excess capacity in the JUP upstream from the wye (a three-way pipeline connection) and would construct a new pipeline downstream from the wye to the existing Board of Water Works of Pueblo Whitlock Water Treatment Plant. From the Whitlock Water Treatment Plant site, new pipeline would be constructed along a route south of Pueblo to St. Charles Mesa and Avondale, crossing Interstate 25 southwest of the Xcel Energy Comanche Powerplant. East of Pueblo, the pipeline would generally be located north of the Arkansas River except between Manzanola and Rocky Ford. The pipeline for the Comanche North Alternative, including spurs, would be about 227 miles long. Primary spur pipelines would be constructed from Fowler north to State Highway 96, then east to Sugar City; between Rocky Ford and La Junta; and a spur to serve Eads. Pipeline sizes would range from 36 inches in diameter at the JUP wye to 4 inches at some water provider tie-ins.

New water treatment plant components would be integrated into the existing Whitlock Water Treatment Plant. The integrated water treatment plant would filter water; disinfection would be the responsibility of AVC water providers at their point of delivery. Under this alternative, the St. Charles Mesa Water District would receive filtered water. Pumping stations would be built at the Whitlock Water Treatment Plant and on the south end of the pipeline spur to Eads. Surge tanks (to manage pipeline pressure) would be built near Fowler and La Junta.



*Comanche North Alternative alignment south of Pueblo (Comanche Powerplant on horizon).*



**Figure 7. Comanche North Alternative**

### Pueblo Dam South Alternative



*Pueblo Dam South Alternative alignment along Bessemer Ditch in Pueblo.*

The Pueblo Dam South Alternative includes constructing AVC without building the Interconnect, but issuing the Master Contract (**Figure 8**). Water would be diverted from the existing Pueblo Reservoir south outlet works. A new pipeline would be constructed from Pueblo Dam, generally following Bessemer Ditch through Pueblo. East of the city, the pipeline would be built generally parallel to U.S. Highway 50 south of the Arkansas River to Lamar. The pipeline for the Pueblo Dam South Alternative would be about 230 miles long. Primary spur pipelines would be constructed from Fowler north to State Highway 96, then east to Sugar City; a spur loop providing redundancy between Rocky Ford and La Junta; and a spur to serve Eads. Pipeline sizes would range from 48 inches in diameter at the dam intake to 4 inches at some AVC participant tie-in locations. One pumping station would be installed on the south end of the pipeline spur to Eads. Except for the spur to Eads, the Pueblo Dam South Alternative is the only alternative that would move water in the pipeline via gravity and would not require extra pumping. Storage tanks would be built near Fowler and La Junta.

A new water treatment plant would be constructed near South Road and 21st Lane in the St. Charles Mesa area. The water treatment plant would filter AVC water; the water providers would disinfect the supply at their delivery points. Under this alternative, the St. Charles Mesa Water District would receive unfiltered water.



**Figure 8. Pueblo Dam South Alternative**



### JUP North Alternative

The JUP North Alternative would include constructing the AVC and Interconnect, without the Master Contract (**Figure 9**). Water would be diverted at Pueblo Reservoir and delivered through the existing JUP to the wye (a three-way pipeline connection) immediately upstream from Pueblo Boulevard north of the Arkansas River. A new pipeline would be built through Pueblo along 11th, 13th, and 14th streets. East of Pueblo, the pipeline would be located north of the Arkansas River. The pipeline for the JUP North Alternative would be about 233 miles long. Pipeline spurs would be similar to the Pueblo Dam South Alternative except the loop spur would be larger and provide two pipeline pathways for deliveries to water providers located between Manzanola and La Junta. Pipeline sizes would range from 42 inches in diameter at the intake to 4 inches at some AVC participant tie-in locations. Two pumping stations would be constructed; one would be located just downstream from the water treatment plant, and another on the south end of the pipeline spur to Eads. Storage tanks would be located near Fowler and La Junta.

A new water treatment plant would be constructed adjacent to the existing Whitlock Water Treatment Plant. The water treatment plant would filter water from AVC; disinfection would be provided by the water providers at their delivery points. Under this alternative, the St. Charles Mesa Water District would receive filtered water.



*JUP North Alternative alignment through Pueblo.*



**Figure 9. JUP North Alternative**



*The Pueblo Dam North Alternative alignment is near the Raptor and Nature Center of Pueblo, along the existing JUP.*

## Pueblo Dam North Alternative

The Pueblo Dam North Alternative would include constructing the AVC and Interconnect, and issuing the Master Contract (**Figure 10**). AVC would generally follow a route through Pueblo along 11th, 13th, and 14th streets, and north of the Arkansas River. Water would be diverted from the Pueblo Reservoir south outlet works. A new pipeline would be constructed adjacent to the railroad on the north side of U.S. Highway 50. East of Pueblo, the pipeline would be built just north of the Arkansas River. The pipeline for the Pueblo Dam North Alternative would be about 236 miles long. Pipeline sizes and spurs would be similar to the JUP North Alternative. Pumping stations would be built at the foot of Pueblo Dam, at the water treatment plant, and on the south end of the pipeline spur to Eads. Storage tanks would be located near Fowler and La Junta.

A new water treatment plant would be constructed below Pueblo Reservoir on Reclamation property immediately south of the fish hatchery. The new water treatment plant would filter water; AVC water providers would be responsible for adding disinfection at their delivery point. Under this alternative, the St. Charles Mesa Water District would receive filtered water.

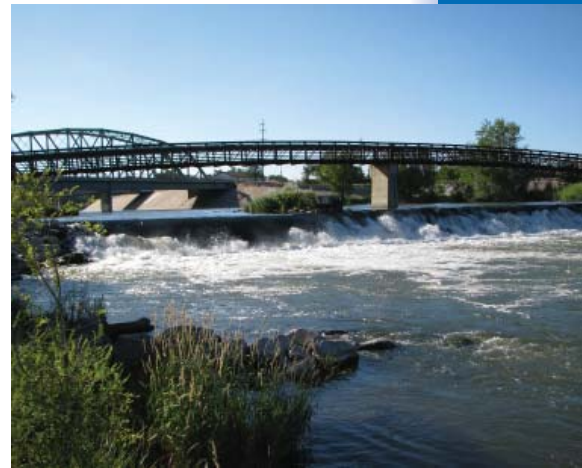


**Figure 10. Pueblo Dam North Alternative**

## River South Alternative

The River South Alternative includes constructing AVC and issuing the Master Contract, but not constructing the Interconnect (**Figure 11**). AVC would divert water from the Arkansas River just upstream from the river's confluence with Fountain Creek near the existing St. Charles Mesa diversion structure and pump station. A new pipeline would be constructed from the Arkansas River generally parallel to the existing St. Charles Mesa Water District pipeline, then along a route south of the Arkansas River. The pipeline for the River South Alternative would be about 216 miles long. Pipeline spurs would be as described for the Pueblo Dam South Alternative. Pipeline sizes would range from 42 inches in diameter at the intake to 4 inches at some AVC participant tie-in locations. Three pumping stations would be built; one would be located near the intake to pump water to the water treatment plant, the second would be located just downstream from the new water treatment plant, and the third would be located on the south end of the pipeline spur to Eads. Storage tanks would be located near Fowler and La Junta.

A new water treatment plant would be constructed adjacent to the existing St. Charles Mesa Water Treatment Plant. The new water treatment plant would both filter and disinfect water for the water provider delivery points. Under this alternative, the St. Charles Mesa Water District would be delivered unfiltered water.



*The River South Alternative river intake location would be near the Arkansas River at Moffat St. gage. A new diversion structure may be needed.*



**Figure 11. River South Alternative**

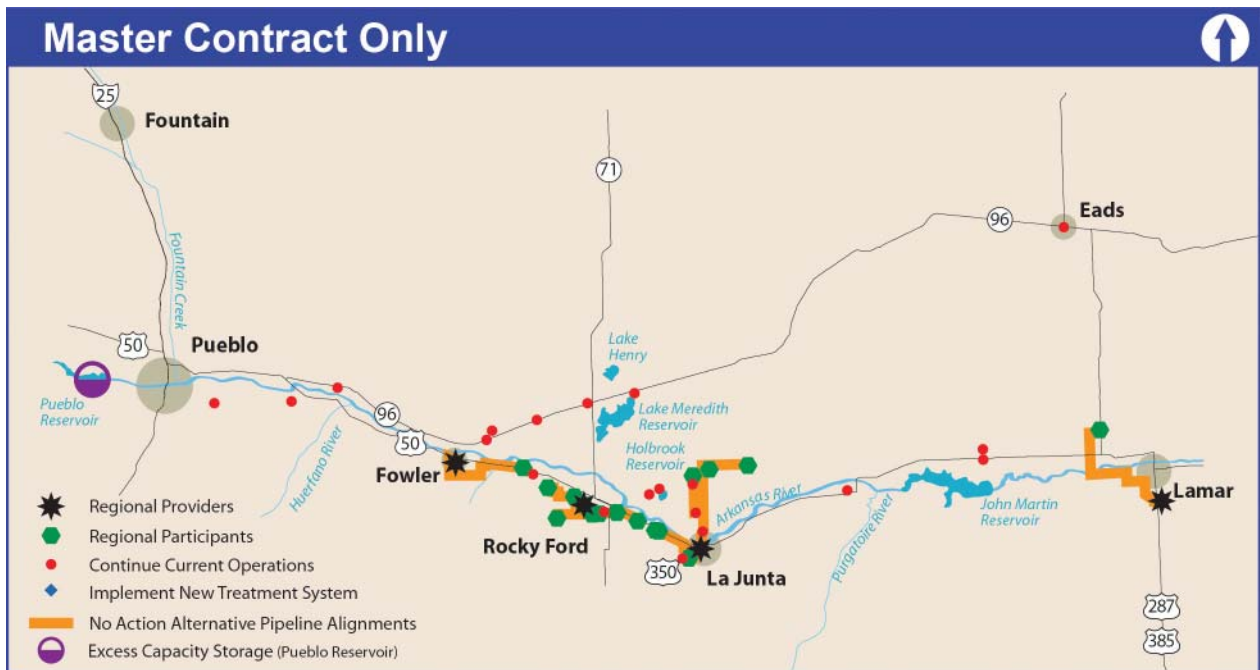


### Master Contract Only Alternative

To provide a range of reasonable and practicable alternatives for evaluation in this EIS, the Master Contract Only Alternative does not include federal actions to build the AVC or Interconnect (**Figure 12**). The Master Contract would include up to 29,938 ac-ft of excess capacity storage in Pueblo Reservoir. Each water provider (**Table 3** on page 7) would request that Reclamation release water from Pueblo Reservoir to either the Arkansas River to an existing or future water delivery system, or exchange water to an upstream location (**Appendix A**). Water could be stored and released if and when space is available after other Fry-Ark commitments have been met. Contract terms and costs for using Pueblo Reservoir excess capacity would be determined during contract negotiations.

Without the AVC or Interconnect, AVC and Interconnect water providers would pursue actions similar to those previously described in the No Action Alternative to meet water supply and water quality needs.

*The Master Contract Only Alternative would use excess capacity storage space in Pueblo Reservoir.*



**Figure 12. Master Contract Only Alternative**



## Common Elements

While each alternative involves different component options, there are common elements, including the following:

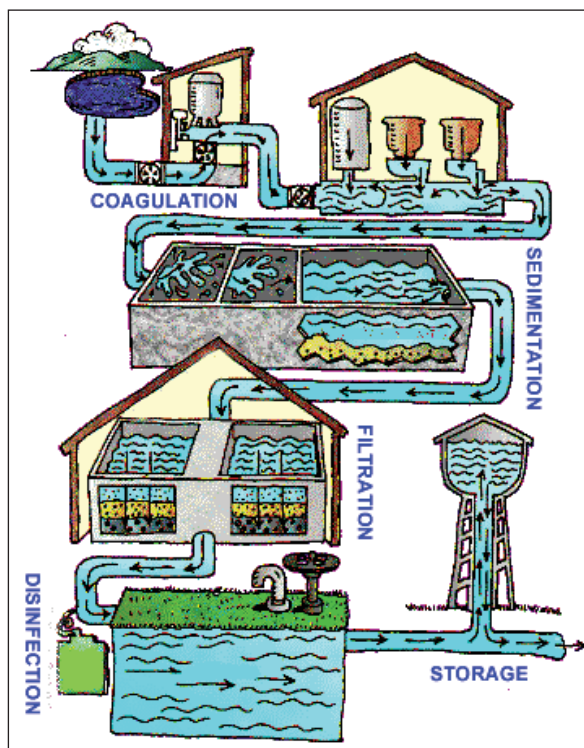
- Water supplies: Fry-Ark water, existing or future agricultural to municipal water rights transfers, supplies from temporary agricultural water transfer programs by the Lower Arkansas Valley Water Conservancy District, and other miscellaneous water rights.
- Water treatment: centralized conventional water treatment plant, would produce either filtered water or filtered and disinfected water.
- Conservation: conservation projects by all water supply customers.
- Construction activities (for alternatives with construction): land purchases and easements, construction techniques, and miscellaneous components.

## Other Considered and Eliminated Alternatives

Reclamation considered a number of alternatives that were eliminated from further study in the Draft EIS, including major transmountain diversion projects like the Central Colorado Project and the Flaming Gorge Pipeline, construction of new potable or nonpotable treatment and distribution systems, and reverse osmosis water treatment plants. Eliminated alternatives did not meet the purpose and needs of the proposed actions; were not technically, economically, or logistically feasible; and/or had less favorable environmental characteristics.



*Agricultural to municipal water rights transfers from the Catlin Canal would be one source of AVC and Master Contract water supply.*



*Courtesy of U.S. EPA*

*Typical regional conventional water treatment facility*

## Identification of the Preferred Alternative

According to Reclamation's 2012 NEPA Handbook, Reclamation shall identify an agency-preferred alternative in the Final EIS. In identifying a preferred alternative, Reclamation should consider:

- If an alternative exists which has the consensus of the affected community and it is reasonable and practicable, meets the purpose and need for action and is within Reclamation's statutory authority to implement, Reclamation should designate it as the preferred alternative.
- The preferred alternative should be an alternative that completes the action and that best meets the purpose and need for the action as defined in the EIS.

Reclamation compared all alternatives in terms of how well each addressed the purpose and need, relevant environmental and non-environmental issues identified by Reclamation during the EIS process, and estimated costs. Based on these considerations, Reclamation has identified the Comanche North Alternative as the preferred alternative. A final preferred alternative will be selected by Reclamation in a Record of Decision.

By diverting water from Pueblo Reservoir via JUP, the preferred alternative would deliver water meeting primary and secondary drinking water standards and would deliver enough water to meet participants' 2070 water demands, assuming base levels of conservation. When coupled with proposed mitigation measures described in this Final EIS, the preferred alternative would have similar or fewer environmental effects compared to other alternatives. The preferred alternative's southern route around the City of Pueblo would have fewer construction effects on existing infrastructure, streets, businesses, and residents compared to alternatives that would construct pipeline in the city. East of Pueblo, aligning the AVC pipeline north of the river avoids most of the U.S. Highway 50 corridor. The preferred alternative would integrate new water treatment plant components into the existing Whitlock Water Treatment Plant, which would minimize water treatment plant construction costs and terrestrial effects. The integrated water treatment plant would filter water; AVC participants would be responsible for adding residual disinfection at their delivery point. The Interconnect would add system redundancy for participants receiving water from either the north or south Pueblo Dam outlets. The Master Contract would increase water supply reliability and drought protection for participants. Estimated present worth construction cost of the preferred alternative is \$400 million. Estimated annual costs of operations, maintenance and replacement costs would be about \$3.5 million. Estimated annual costs for the Master Contract account would range from about \$0.8 million to nearly \$1.1 million.



*The Southeastern Colorado  
Water Conservancy District  
Board of Directors  
discusses AVC.*

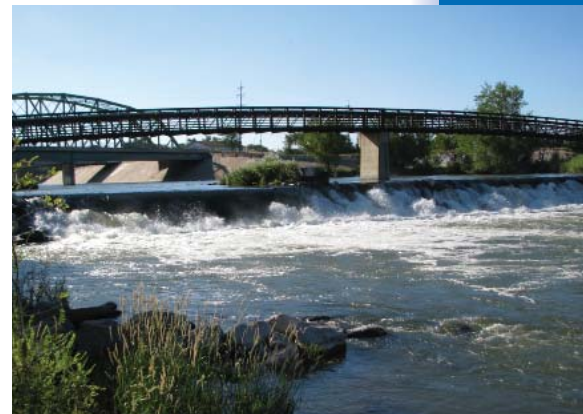
## Scope of Environmental Impact Statement

Analyses in this EIS comply with NEPA, the Council on Environmental Quality regulations that implement NEPA (40 Code of Federal Regulations 1500), and Reclamation's NEPA Handbook (Reclamation 2012b). The Final EIS contains the following chapters:

- Chapter 1 describes the goals or objectives of proposed federal actions and why each is needed.
- Chapter 2 summarizes a No Action Alternative and six action alternatives, and best management practices to avoid or minimize effects. The preferred alternative is identified in this chapter.
- Chapter 3 discusses the environment that would be affected by implementing the alternatives.
- Chapter 4 discloses the potential environmental effects of alternatives and includes mitigation measures for the action alternatives.
- Chapter 5 discusses applicable laws and regulations and consultation and coordination with the public, agencies, and tribes

The study area for resource analyses includes large portions of the Arkansas River Basin and parts of the Roaring Fork River and Fryingpan River watersheds on the West Slope (**Figure 13**). Constructing and operating the proposed actions would affect various environmental resources and geographical areas differently. For example, effects on vegetation may be local, corresponding to physical disturbances associated with construction. Conversely, effects on streamflow may be more widespread because of water diversions, storage, and releases. Each resource has a defined analysis area used to evaluate effects that encompasses all or part of the study area. The EIS study area includes the following areas:

- West Slope: Roaring Fork River upstream from Aspen, Fryingpan River upstream from Thomasville; includes tributaries of both streams.
- Fountain Creek: Fountain Creek from approximately Stratmoor Hills (the most upstream Master Contract water provider) to its confluence with the Arkansas River.
- Upper Arkansas River Basin: Arkansas River from its confluence with Lake Fork to Pueblo Reservoir, Grape Creek, Lake Fork, Lake Creek, Turquoise Lake, and Twin Lakes.
- Lower Arkansas River Basin: Arkansas River from Pueblo Reservoir to John Martin Reservoir, Pueblo Reservoir, Lake Meredith, Lake Henry, and Holbrook Reservoir.
- John Martin Reservoir and Downstream: John Martin Reservoir to the Arkansas River near Granada gage close to the Colorado-Kansas state line.



*Arkansas River at the Moffat Street gage.*

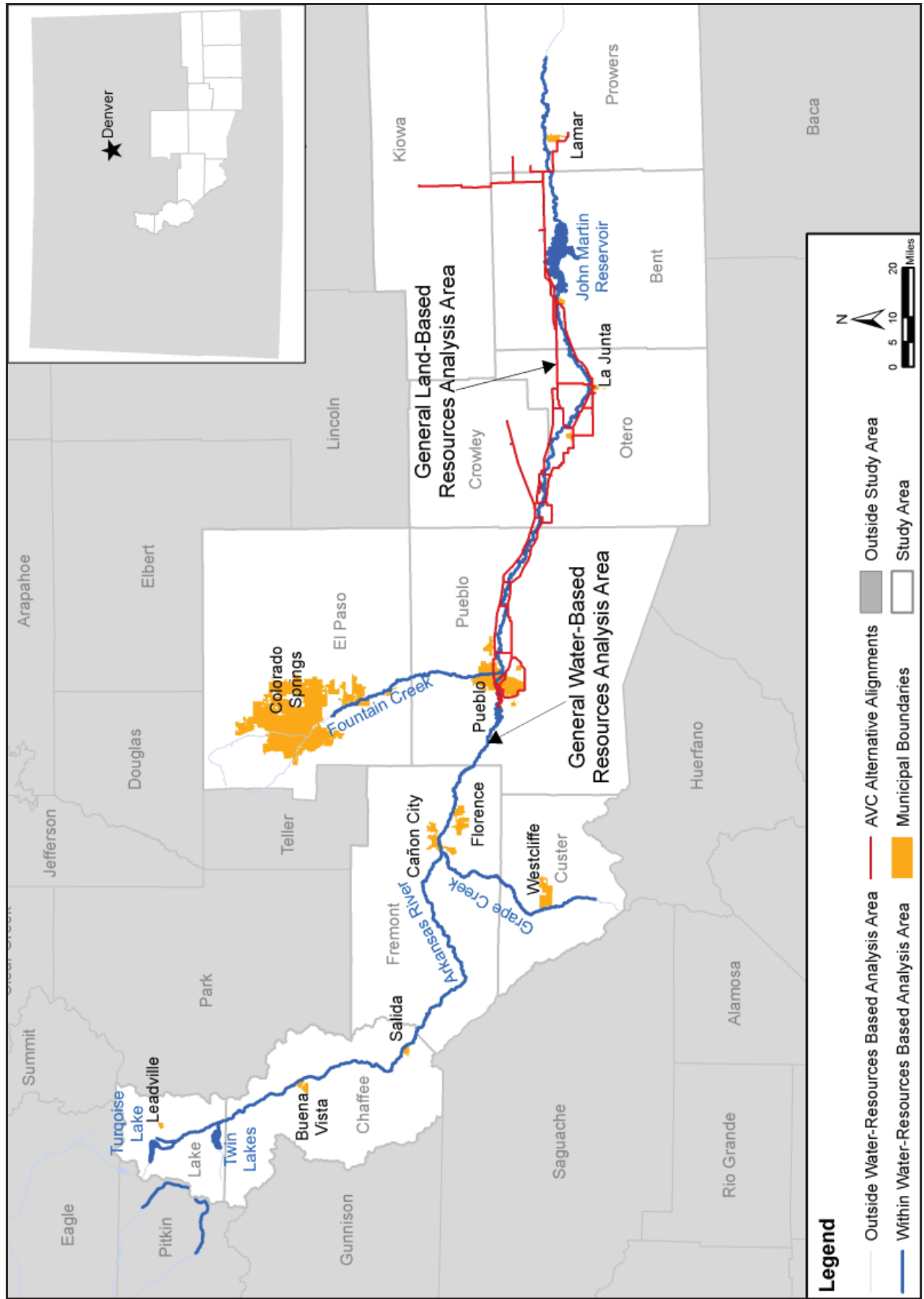


Figure 13. Arkansas Valley Conduit Environmental Impact Statement Study Area



# Environmental Consequences

To evaluate environmental effects of the proposed actions, two primary comparisons were made (43 Code of Federal Regulations 46).

**No Action Alternative to Existing Conditions:** This comparison shows the consequences that could be expected in the absence of an implemented action alternative.

**Action Alternatives to No Action Alternative:** This comparison evaluates the “net effects or impacts” of each action alternative compared to the No Action Alternative.

The direct and indirect effects of the alternatives are summarized in **Table 5** and **Table 6**, followed by a discussion of each resource. All effects assume best management practices are implemented but not mitigation. The intensity of effects (negligible, minor, moderate, and major) is defined differently for each resource topic. These intensities, along with methods to assess effects, are described in Chapter 4 of the EIS.

The No Action Alternative would have the following effects compared to existing conditions:
<ul style="list-style-type: none"><li>• Would not meet the purpose and need for municipal and industrial water because it would not supplement or replace existing poor quality water without AVC.</li></ul>
<ul style="list-style-type: none"><li>• Without the Interconnect, would not meet the need for a backup Pueblo Dam outlet for water provider delivery systems.</li></ul>
<ul style="list-style-type: none"><li>• Would not secure a reliable long-term water supply for water providers to help meet projected demand without the Master Contract.</li></ul>
<ul style="list-style-type: none"><li>• Storage, streamflow, and groundwater levels at and below Pueblo Reservoir would typically be lower because of increased demands for water. Streamflow would increase in Fountain Creek due to more treated wastewater discharge.</li></ul>
<ul style="list-style-type: none"><li>• Water quality would change slightly depending on local streamflow. Erosion in Fountain Creek would continue. Drinking water would no longer contain harmful amounts of radioactivity, but would have high levels of salt except for water systems with reverse osmosis.</li></ul>
<ul style="list-style-type: none"><li>• Changes in storage and streamflow would not substantially affect fish and river insect species. Land-based and water-based recreation in the Arkansas River Basin would not change noticeably.</li></ul>
<ul style="list-style-type: none"><li>• Construction activities would temporarily disturb vegetation and wildlife except for several acres of upland vegetation that would be permanently replaced by expanded water treatment plants. The No Action Alternative would not adversely affect federally-listed threatened and endangered species.</li></ul>
<ul style="list-style-type: none"><li>• Construction and operating expenses would not substantially benefit the regional economy. Water providers would be responsible to pay 100 percent of No Action Alternative costs.</li></ul>
<ul style="list-style-type: none"><li>• Two known historic properties would be impacted.</li></ul>

**Table 5. Summary of Direct and Indirect Effects for Affected Resource Topics Compared to No Action Alternative**

<div><div>Major</div><div>Moderate</div><div>Minor</div><div>Negligible</div><div>Minor</div><div>Moderate</div><div>Major</div></div> <div><div>Beneficial ↔ Adverse Increase ↔ Decrease</div><div>(Surface Water)</div></div>							COMANCHE NORTH	PUEBLO DAM SOUTH	JUP NORTH	PUEBLO DAM NORTH	RIVER SOUTH	MASTER CONTRACT ONLY
RESOURCE TOPIC <sup>(1)</sup>												
Surface Water <sup>(2)</sup>												
Streamflow – East Slope (except as noted)							=	=	=	=	=	=
Streamflow – Arkansas River above Pueblo							⊖	⊖	⊖	⊖	=	=
Streamflow – Arkansas River at Moffat St.							⊖	⊖	=	⊖	⊖	=
Streamflow – Arkansas River near Granada							=	=	=	=	=	=
Streamflow – West Slope							=	=	=	=	=	=
Storage Contents – Pueblo Reservoir							=	=	⊖	=	=	⬆
Storage Contents – Holbrook Reservoir <sup>(3)</sup>							⬇	⬇	=	⬇	⬇	⬇
Groundwater												
Groundwater Level – Upper Arkansas Alluvium							=	=	=	=	=	=
Groundwater Level – Lower Arkansas Alluvium							=	=	=	=	=	=
Groundwater Level – Fountain Creek Alluvium							⬆	⬆	⬆	⬆	⬆	⬆
Groundwater Level – Consolidated Bedrock Aquifer							=	=	=	=	=	=
Water Quality												
Total Maximum Daily Load Allocations – Upper Arkansas River							=	=	=	=	=	=
Salts, Selenium, Sulfate, Uranium, and Nutrients – Lower Arkansas River							⊖	⊖	⊖	⊖	=	=
Salts and Selenium – Lake Henry, Lake Meredith, and Holbrook Reservoir							⊖	⊖	⊖	⊖	⊖	⊖
Chronic Low Flows – La Junta							⊖	⊖	⊖	⊖	⊖	⊖
Bacteria – Fountain Creek							=	=	=	=	=	=
Selenium – Fountain Creek							⊖	⊖	=	⊖	⊖	⊖
Chronic Low Flows – Fountain Creek							=	=	=	=	=	=
Temperature – Arkansas River above Pueblo Gage							=	=	⊖	=	=	=
Geomorphology												
Erosion and Sedimentation							=	=	=	=	=	=
Aquatic Life												
Stream-Based							=	=	=	=	=	=
Turquoise Lake and Twin Lakes							=	=	=	=	=	=
Pueblo Reservoir							=	=	⬇	=	=	=
Lake Meredith, Lake Henry, and John Martin Reservoir							=	=	=	=	=	=
Holbrook Reservoir <sup>(3)</sup>							⬇	⬇	=	⬇	⬇	⬇
Recreation												
Water-Based – Arkansas River, Fountain Creek							=	=	=	=	=	=

<div><div>Major</div><div>Moderate</div><div>Minor</div><div>Negligible</div><div>Minor</div><div>Moderate</div><div>Major</div></div> <div>Beneficial ↔ Adverse Increase ↔ Decrease (Surface Water)</div>							COMANCHE NORTH	PUEBLO DAM SOUTH	JUP NORTH	PUEBLO DAM NORTH	RIVER SOUTH	MASTER CONTRACT ONLY
RESOURCE TOPIC <sup>(1)</sup>												
Water-Based – Pueblo Reservoir							=	=	⊖	=	=	⊕
Water-Based – Holbrook Reservoir <sup>(3)</sup>							⊖	⊖	=	⊖	⊖	⊖
Land-Based – Construction Related (Pueblo)							⊖	⊖	⊖	⊖	⊖	=
Vegetation and Wetlands												
Upland and Riparian Vegetation							⊖	⊖	⊖	⊖	⊖	=
Wetlands							⊖	⊖	⊖	⊖	⊖	=
Federal Threatened and Endangered Species							=	=	=	=	=	=
Colorado Species of Concern Potential Habitat							⊖	⊖	⊖	⊖	=	=
Wildlife												
Game and Small Mammals, Amphibians, Reptiles							=	=	=	=	=	=
Birds of Conservation Concern, Other Birds							=	=	=	=	=	=
Federal Threatened and Endangered Species							⊖	⊖	⊖	⊖	⊖	⊖
Colorado Threatened and Endangered Species							⊖	⊖	⊖	⊖	⊖	⊖
Human Environment												
Noise and Traffic							⊖	⊖	⊖	⊖	⊖	=
Vibration							=	⊖	⊖	⊖	=	=
Visual							⊖	⊖	⊖	⊖	⊖	=
Utility Services							=	=	⊖	⊖	=	=
Land Use							⊖	⊖	⊖	⊖	⊖	=
Socioeconomics												
Construction Expenditures							⊕	⊕	⊕	⊕	⊕	=
OM&R Expenditures							⊖	⊖	⊖	⊖	⊖	=
Municipal Water Quality							⊕	⊕	⊕	⊕	⊕	=
Agricultural Dry-Up and Recreation							=	=	=	=	=	=
Environmental Justice												
Minority and Low Income Population Effects							=	=	⊖	⊖	=	=
Historic Properties												
Known Historic Properties							⊖	●	●	●	⊖	⊖

Notes:

- <sup>(1)</sup> Resource topics with no notable beneficial or adverse effects include air quality, floodplains and flood hydrology, geology and paleontology, hazardous materials, Indian trust assets, and farmland.
- <sup>(2)</sup> Surface water effects depend on assumptions and reasonably foreseeable actions contained in the model, and are described in Chapter 4. Surface Water effects are an increase or decrease in streamflow and reservoir storage. Each resource assesses whether these changes are adverse or beneficial.
- <sup>(3)</sup> Moderate effects on Holbrook Reservoir during certain months are not direct effects of AVC/Master Contract operations; rather, the effects result from the following:
  - Modeling switches that govern Colorado Springs operations, and the indirect effects of those operations on Holbrook Reservoir, are activated by small changes in the quantity and timing of streamflow and reservoir storage in the Lower Arkansas River Basin (see Appendix D.4)
  - Holbrook Reservoir storage contents can become low historically and in the simulated existing conditions and No Action Alternative. During these times, a small change in volume can result in a large percent change and trigger a moderate significance level.

**Table 6. Summary of Surface Water Hydrology Monthly Direct and Indirect Effects for Normal and Dry Years**

<div><div>Major</div><div>Moderate</div><div>Minor</div><div>Negligible</div><div>Minor</div><div>Moderate</div><div>Major</div></div> <div><div>Beneficial ↔ Adverse Increase ↔ Decrease</div><div>(Surface Water)</div></div> <div>RESOURCE TOPIC</div>							COMANCHE NORTH	PUEBLO DAM SOUTH	JUP NORTH	PUEBLO DAM NORTH	RIVER SOUTH	MASTER CONTRACT ONLY
<div>⬢</div>	<div>⬢</div>	<div>⬢</div>	<div>=</div>	<div>⬢</div>	<div>⬢</div>							
Arkansas River Above Pueblo Streamflow <sup>(1)</sup>												
Maximum Normal Year Increase	(2)	(2)	(2)	(2)	<div>⬢</div>	<div>⬢</div>						
Maximum Normal Year Decrease	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>						
Maximum Dry Year Increase	(2)	(2)	(2)	(2)	<div>⬢</div>	=						
Maximum Dry Year Decrease	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>						
Pueblo Reservoir Storage <sup>(1)</sup>												
Maximum Normal Year Increase	(2)	(2)	(2)	(2)	(2)	<div>⬢</div>						
Maximum Normal Year Decrease	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>	(2)						
Maximum Dry Year Increase	(2)	(2)	(2)	(2)	(2)	<div>⬢</div>						
Maximum Dry Year Decrease	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>	<div>⬢</div>	(2)						

Notes:

<sup>(1)</sup> Effects are assessed in comparison to the No Action Alternative. Only gages with moderate or major effects are shown in this table.

<sup>(2)</sup> No increases or decreases occur.

### Climate Change

Decreases in Colorado River and Arkansas River Basin runoff caused by climate change (ranging from a 7 percent to 21 percent decrease in runoff) would decrease annual average AVC water supply by up to 1,300 ac-ft. Less water would likely require water providers to secure additional non-Fry-Ark supplies sometime in the future to meet full demand. These additional water supplies would likely combine additional permanent or temporary agricultural water purchases or purchases from other water providers with excess supply.

### Surface Water Hydrology

Arkansas River Basin streamflow and reservoir operations within the study area were simulated with EIS alternatives using the Arkansas River Daily Simulation Model and other spreadsheet models. See Appendix D.3 and D.5 for descriptions of these models and assumptions.

All alternatives would cause some minor (less than 10 percent) decreases in streamflow in the Upper Arkansas River Basin during winter and spring months in normal and wet years due to changes in Fry-Ark reservoir storage volumes. Effects during other times are mostly negligible.



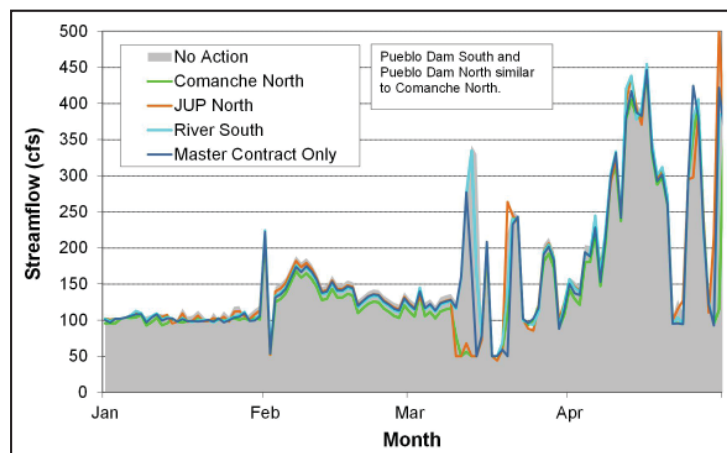
The Comanche North, Pueblo Dam South, JUP North, and Pueblo Dam North alternatives would cause occasional moderate (greater than 10 percent) decreases downstream from Pueblo Reservoir during some winter and spring months in dry and normal years (**Figure 14**). During wet years, all alternatives except JUP North would cause minor to moderate increases in streamflow through Pueblo during some months. The JUP North Alternative typically would have less storage volume in Pueblo Reservoir before and during wet years and would release less from the reservoir. The Comanche North, Pueblo Dam South, JUP North, and Pueblo Dam North alternatives would cause minor decreases in streamflow in Arkansas River flows through Pueblo based on predicted annual average flows. The alternatives would affect streamflow by diverting nearly 10,300 ac-ft/year of water supplies into AVC and bypassing the Arkansas River (average streamflow at the Arkansas River near Avondale gage is about 682,000 ac-ft/year under the No Action Alternative), and/or by water providers trading their downstream supplies for upstream water to be stored in Master Contract accounts, which would reduce streamflow between the two exchange points. See Chapter 4 for additional information on changes in Arkansas River streamflow through Pueblo.

All alternatives would cause occasional minor increases in streamflow downstream from John Martin Reservoir. Minor decreases in streamflow downstream from John Martin Reservoir for the JUP North Alternative would be caused by a decrease in John Martin Reservoir inflow during some wet years.

Increases in Fountain Creek streamflow for all alternatives except JUP North would cause minor effects, especially in winter and early spring months. These effects would increase in dry years when winter and early spring effects would be moderate.

The JUP North Alternative would cause minor streamflow decreases in July and minor streamflow increases in August at the Fryingpan River at Thomasville gage on the West Slope. This would occur because increased use of Fry-Ark water in this alternative would increase West Slope diversions earlier in the season during wet years to fill Fry-Ark storage space. Diversions would be less late in the summer, causing higher streamflow.

The JUP North Alternative would cause a minor (less than 10 percent) decrease in reservoir water levels and storage volumes in Pueblo Reservoir. Occasional minor increases would occur in Turquoise Lake storage contents in wet and dry years for most



**Figure 14. Simulated Winter and Spring Dry Year (2004) Daily Streamflow – Arkansas River Above Pueblo Gage**



*Streamflow below Pueblo Reservoir would be affected by AVC and Master Contract.*

alternatives. All alternatives except JUP North would cause moderate decreases (more than 10 percent) in reservoir water levels and storage volumes in Holbrook Reservoir during summer and fall months of normal and dry years.

### Groundwater Hydrology

All alternatives would negligibly affect alluvial groundwater levels in the Upper and Lower Arkansas River basins (see Chapter 4). Effects of decreasing groundwater pumping in the Fountain Creek Basin alluvial aquifers would be minor compared to the No Action Alternative, would raise groundwater levels (measurable but localized), and would be beneficial for all action alternatives. Basement flooding would not increase under the action alternatives. The No Action Alternative would decrease water table levels compared to existing conditions because of additional groundwater pumping from these sources to meet demands.



*Groundwater is used for municipal and agricultural water supply and affects Arkansas River streamflow.*

### Water Quality

The alternatives would negligibly affect Upper Arkansas River Basin water quality, as streamflow and reservoir changes would be minimal. Current Total Maximum Daily Loads (written plans and analyses that help a water body meet water quality standards) in the Upper Arkansas River Basin would not be affected adversely. West Slope water quality would not be affected.

All alternatives except River South and Master Contract Only would have minor (less than 10 percent of historical water quality conditions) adverse effects in some months to water quality due to salts, selenium, and nutrient concentrations through Pueblo (Arkansas River at Moffat Street gage). Occasional moderate (between 10 and 20 percent of historical water quality conditions) adverse increases in salts and selenium would occur in dry years. In the River South and Master Contract Only alternatives, water supplies for water providers downstream from Pueblo would not bypass the city in a pipeline and would not affect streamflow at this gage.

All alternatives would have minor adverse effects on water quality in some months at the Arkansas River near Avondale gage from salts, selenium, and nutrient concentrations, especially in dry years. Occasional moderate adverse increases in selenium would occur in dry years at this gage; effects would decrease downstream. Effects on water quality at the Arkansas River at Las Animas gage would be negligible. Effects on La Junta's wastewater discharge permit would be minor due to decreases in Arkansas River low flows. Chapter 4 has additional details on surface water quality effects in the Arkansas River.

The changes in Fountain Creek streamflow and pumping patterns from alternatives would cause occasional minor, adverse increases in salts during normal years. All alternatives except JUP North would

have minor adverse effects on water quality from selenium concentrations during some months in Fountain Creek.

Adverse temperature effects would be minor for the JUP North Alternative because of increases in maximum daily average Pueblo Reservoir release temperatures (just over 1 degree Celsius) (Ortiz 2012). Lake Meredith, Lake Henry, and Holbrook Reservoir would have minor adverse effects on water quality from salts and selenium concentrations in all alternatives.

AVC deliveries under alternatives with an intake at Pueblo Reservoir would meet secondary drinking water standards because water in Pueblo Reservoir is low in salts. AVC deliveries under the River South Alternative would occasionally exceed secondary drinking water standards in fall and winter months during dry years because the water quality at the river intake is not as good as Pueblo Reservoir. Water providers in the No Action and Master Contract Only alternatives who do not have advanced salts removal treatment systems, such as reverse osmosis, likely would not meet secondary drinking water standards during most months because water quality downstream from Pueblo is poor. All alternatives, including the No Action Alternative, would address current Health Department enforcement orders for radioactive contaminants by replacing or treating contaminated supplies.

### **Geomorphology**

Effects on Fountain Creek erosion and sedimentation processes (streamflow causing dirt, sand, and gravel to move from Upper Fountain Creek to Lower Fountain Creek and the Arkansas River), would be negligible (see Chapter 4). Effects on erosion and sedimentation in West Slope streams would also be negligible.

### **Aquatic Life**

Direct and indirect effects on Upper Arkansas River Basin aquatic life, including river insects, would be negligible for all alternatives. Changes in brown trout and rainbow trout habitat availability, including during important pre- and post-runoff periods identified by Colorado Parks and Wildlife, would be minimal (see Chapter 4).

Effects on aquatic life, including river insects, in the Arkansas River between Pueblo Reservoir and the Fountain Creek confluence would be negligible for all alternatives. For most of the year, changes in habitat availability among the alternatives would be negligible, although effects would occasionally be greater under certain low streamflow conditions. Hydrology and water quality changes in this river segment would cause negligible effects on aquatic life.

Aquatic life effects in the remainder of the Lower Arkansas River Basin, including Fountain Creek, would be negligible for all alternatives.



*Water quality at the Avondale gage is affected by streamflow changes in the Arkansas River and Fountain Creek.*



*Flathead chub adult, a Colorado species of special concern.*



All alternatives except JUP North would negligibly affect Pueblo Reservoir aquatic life. The JUP North Alternative would decrease Pueblo Reservoir storage contents, elevation, and surface area throughout the year and would cause moderate (readily apparent and sometimes outside range of natural patterns) adverse effects on habitat for spawning fish and overall fish habitat related to survival and growth. All alternatives except JUP North would cause moderate adverse effects to aquatic life for Holbrook Reservoir due to moderate decreases in storage, elevation, and surface area from June through November of normal and dry years (see Chapter 4).

### Recreation

All action alternatives that include AVC would cause short-term displacement of recreational use during construction. The Pueblo Dam North Alternative would moderately (visitor use would decline) reduce recreation opportunities on trails through Pueblo and at the Nature and Raptor Center of Pueblo during the period of construction. The JUP North Alternative would cause minor (detectable but visitor use would not decline) reductions in recreational opportunities at Pueblo Reservoir because of reductions in reservoir levels. The Comanche North Alternative would have short-term minor effects on City Park and the Elmwood Golf Course in Pueblo due to construction disturbance. All alternatives except JUP North would have moderate adverse effects on recreation at Holbrook Reservoir. All alternatives with AVC would cross portions of the Santa Fe National Historic Trail, but short-term construction activities would be unlikely to adversely affect recreation and interpretative opportunities.

All alternatives would negligibly affect fishing and boating along the Arkansas River downstream from Pueblo Reservoir and through Pueblo (**Table 7**). Compared to the No Action Alternative, all action alternatives except River South would slightly decrease the ability to meet Pueblo Flow Management Program target flows during the winter. The River South Alternative would slightly increase target flow occurrences all year. The small flow changes under all alternatives would be unlikely to measurably affect recreation use or the quality of the experience. See Chapter 4 for additional details on recreation effects.



*Pueblo kayak park could be affected by changing streamflows.*

**Table 7. Percent of Time Pueblo Flow Management Targets Are Met**

PERIOD	EXISTING CONDITION	NO ACTION	COMANCHE NORTH	PUEBLO DAM SOUTH	JUP NORTH	PUEBLO DAM NORTH	RIVER SOUTH	MASTER CONTRACT ONLY
Overall	89.2	89.3	88.8	88.5	88.3	88.8	90.3	89.4
Summer	94.7	95.4	95.6	95.5	95.1	95.6	96.3	95.5
Winter	78.3	77.0	74.9	74.6	74.4	75.0	78.2	77.0



## Vegetation and Wetlands

All action alternatives that include AVC could cause minor (affect vegetation in local areas) to moderate (affect vegetation in the region) losses of native plant communities and potential species of concern habitat along pipeline corridors. Revegetation of temporary vegetation disturbances and other mitigation measures would reduce the effects associated with pipeline construction (see Chapter 4). Vegetation communities at aboveground structures, such as pump stations, tanks, and water treatment plants, would be lost.

All alternatives would cause temporary effects to wetland and riparian areas during construction. Restoration and revegetation would minimize long-term effects. The JUP North Alternative would result in a moderate (1 to 10 acres) permanent loss of wetlands that would require replacement wetlands. The remaining alternatives would have no permanent effects on wetlands.

## Wildlife

None of the alternatives would directly disturb suitable habitat for federally listed threatened or endangered species, proposed, candidate species, or critical habitat. John Martin Reservoir water levels generally would be slightly higher under all alternatives with the same seasonal pattern of operation. Because suitable nesting habitat for the federally listed piping plover and least tern at John Martin Reservoir depends on active management, slightly higher John Martin Reservoir water levels under all alternatives would have a minor effect on these species (see Chapter 4 for additional information on piping plover and least tern effects). All alternatives would have a short-term negligible effect on lesser prairie chicken habitat and no effects on known breeding sites.

Effects on upland state wildlife mammal and bird species of concern would be minor (small and localized) under all alternatives. AVC pipeline construction would have short-term negligible effects following revegetation of temporarily disturbed lands. The triploid checkered whiptail, a state sensitive species, would experience minor effects from short-term pipeline construction of all alternatives. Pipeline construction for all alternatives would have minor effects on roundtail horned lizard and common kingsnake populations; both are state sensitive species.

Pipeline construction activities under AVC alternatives would have temporary minor effects on a variety of wide ranging upland wildlife species, game animals, small mammals, and bird species. Effects would be negligible due to the temporary nature of disturbances and restoration of habitat following construction along with implementation of mitigation measures, including a migratory bird management plan.



*Wetlands could be affected at the JUP North Alternative water treatment plant site southwest of the Whitlock Water Treatment Plant in Pueblo.*



*Photo courtesy of U.S. Fish & Wildlife*

*Piping Plover*



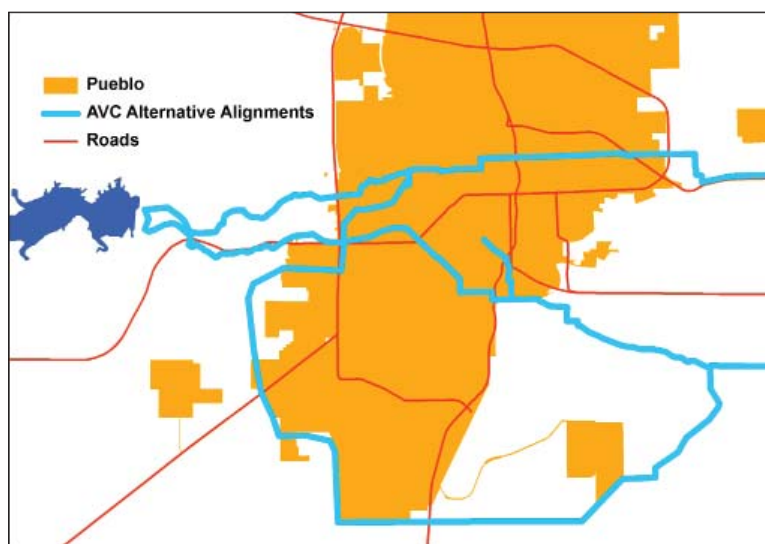
*Construction in cities and towns can temporarily disrupt traffic and utilities.*

## Human Environment

The Pueblo Dam South, JUP North, and Pueblo Dam North alternatives would cause an unavoidable moderate (readily detectable with local consequences) increase in noise levels during construction through Pueblo. The Comanche North and River South alternatives would have minor (detectable but with little consequences) noise effects. Increased noise levels during operation of some alternatives' components, such as pump stations and water treatment plants, would continue through the life of the component; such noise may not be audible beyond the facility's property boundary. Vibration would be felt close to construction equipment, a minor (detectable, but with little consequences) effect, for the Pueblo Dam South, JUP North, and Pueblo Dam North alternatives. Mitigation would lessen these noise and vibration effects. All alternatives that include AVC

would have a minor (affects one or two observation points) effect on the visual landscape from construction of permanent, man-made forms, such as water treatment plants, pump stations, and other facilities.

The Pueblo Dam South, JUP North, and Pueblo Dam North alternatives would cause a short-term, minor increase in traffic volumes during construction because of the pipeline alignment through Pueblo (**Figure 15**). The Comanche North and River South alternatives would cause minor (noticeable but would not decrease transportation) traffic disruptions during construction. The JUP North and



**Figure 15. AVC Alternative Alignments in Human Environment (Pueblo)**

Pueblo Dam North alternatives would result in minor (noticeable but would not decrease services) effects on utilities in Pueblo during construction. Mitigation would lessen traffic and utility disruption effects (see Chapter 4).

## Socioeconomics

Federal funds spent locally to construct the action alternatives would provide a minor (less than 10 percent of economy) increase to the local economy (see Chapter 4). The cost of operating and maintaining AVC would be less than or equal to costs under the No Action Alternative and would have minor adverse effects on the regional economy. Localized economic effects could be greater or less, depending on where direct expenditures occur in the region.

Alternatives with a Pueblo Reservoir AVC intake would have a moderate (between 10 and 20 percent of costs) beneficial effect on household costs due to improvements in water supply salts concentrations. The River South Alternative, which would have a river intake, would have a minor beneficial effect on household costs. The Master Contract Only Alternative is the same as the No Action Alternative and would not decrease water supply salt concentrations.

Regional socioeconomic effects caused by changing agricultural water rights to municipal water rights (agricultural dry-up) would be negligible for all alternatives. The action alternatives would have agricultural dry-up similar to the No Action Alternative and would not affect the regional economy. Regional recreation economic effects for all alternatives would be negligible because effects on location-specific recreation activities would be negligible to minor and would not affect the regional economy.

### ***Environmental Justice***

Constructing action alternative facilities would most directly affect people living, recreating, or pursuing other activities in the immediate areas, particularly in Pueblo. The Comanche North, Pueblo Dam South, River South, and Master Contract Only alternatives would have a negligible environmental justice effect (percentage of affected minority or low income population would not be greater than 5 percent of No Action minority or low income population). The JUP North and Pueblo Dam North alternatives would affect more minority population than No Action, but the difference is less than 10 percent and would be minor.

### ***Historic Properties***

All alternatives may adversely impact resources listed or eligible for listing in the National Register of Historic Places. The number, type, and location of affected resources would vary by alternative, but the Pueblo Dam South, JUP North, and Pueblo Dam North alternatives' impacts would be major (more than 40 properties), while the River South alternatives would have moderate (between 20 and 40 properties) impacts (see Chapter 4), and the Comanche North and Master Contract Only alternatives would have minor (less than 20 properties) impacts. Mitigation or avoidance would lessen the extent of impacts on historic properties. Reclamation, in cooperation with the State Historic Preservation Office, National Park Service, and other consulting parties, developed a programmatic agreement to address potential impacts to historic properties (Appendix N).



*Boone Railroad Depot.*

## Best Management Practices and Mitigation Measures

Best management practices are intended to avoid or reduce general construction-related effects. Several best management practices were identified and incorporated into the action alternatives to avoid and reduce adverse effects. Resource effects assessments assumed that best management practices would be implemented under each alternative except the No Action Alternative.

Mitigation measures are methods or plans to reduce, offset, or eliminate adverse project effects. Mitigation could include one or more of the following:

- Avoiding effects
- Minimizing effects by limiting the degree or magnitude of an action
- Rectifying effects by restoration, rehabilitation, or repair of the affected environment
- Reducing or eliminating effects over time
- Replacing or providing substitute resources or environments to offset a loss



*Best management practices would include silt fences to manage erosion during construction.*

Mitigation measures were primarily identified for surface water hydrology, aquatic life, recreation, vegetation and wetlands, wildlife, the human environment, and cultural resources. Surface water hydrology and aquatic life mitigation measures would reduce the effects of occasional low streamflows on habitat below Pueblo Reservoir. Recreation mitigation measures are designed to minimize temporary effects at recreation areas during construction, and permanent effects on recreational boating if structures were constructed in the Arkansas River. Vegetation and wetlands mitigation includes mitigation of effects to jurisdictional wetlands and waters of the United States and avoidance or protection of rare plant species during construction. Similarly, wildlife mitigation measures would include commitments to complete a Migratory Bird Management Plan and a Fish and Wildlife Coordination Act Report, which would identify and help to avoid or protect sensitive fish and wildlife habitat.

Several mitigation measures were identified for the human environment to reduce the effects of construction through urban areas, including notifying landowners along the route, providing detours and business access during construction, using construction methods that reduce noise and vibration, and providing incentives to expedite construction where traffic effects would be greatest.

Cultural resource mitigation measures are required by federal and state law. Compliance with Section 106 of the National Historic Preservation Act would be completed before construction by



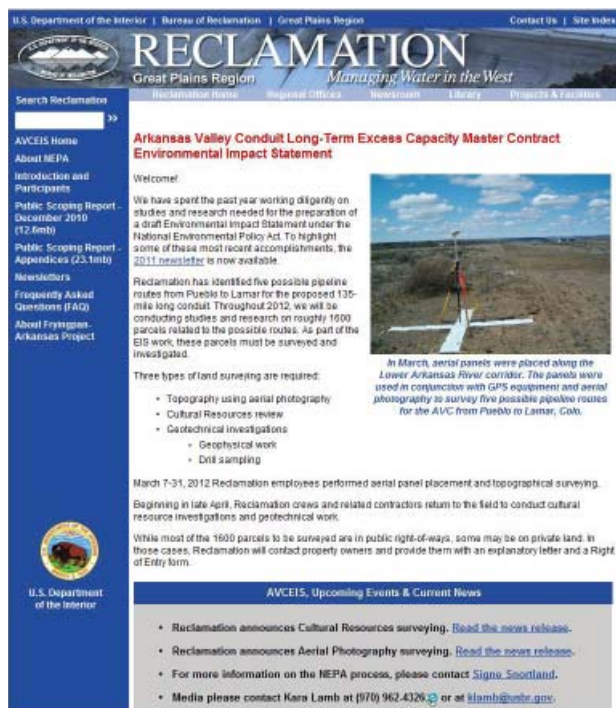
completing remaining inventory, performing eligibility determinations, and making determinations of effect and mitigation, in consultation with the State Historic Preservation Office and interested tribes. Reclamation has prepared a programmatic agreement (see Appendix N) that gives guidance for following Section 106 once the NEPA process has been completed.

## Consultation and Coordination

In 2010, Reclamation began a public involvement program to offer the public, organizations, and governmental agencies multiple ways to learn about and participate in the Draft and Final EIS. The public involvement process included the following tasks:

- Publishing a Notice of Intent in the *Federal Register* (Reclamation 2010f)
- Holding five formal public scoping meetings in the area potentially affected by the proposed actions
- Preparing and distributing a December 2010 Public Scoping Report (Reclamation 2010d)
- Meeting with federal, state, regional, and local governmental agencies
- Mailing scoping information to agencies, tribes, and the public
- Forming a Cooperating Agency Team
- Issuing news releases and study updates
- Creating and disseminating information and updates via a Web site dedicated to the EIS ([www.usbr.gov/avceis](http://www.usbr.gov/avceis))
- Publishing and distributing periodic newsletters
- Publishing a Notice of Availability for the Draft EIS in the *Federal Register* (Reclamation 2012d)
- Holding five formal public hearings in the area potentially affected by the proposed actions
- Preparing and distributing responses to public comments as part of this Final EIS (See Appendix P)
- Publishing a Notice of Availability for the Final EIS in the *Federal Register* (Reclamation 2013b)

Consultation and coordination are closely related to scoping and public involvement because these processes integrate the provisions of other environmental statutes and the needs of interested parties. Activities conducted during this EIS included Endangered Species Act and Fish and Wildlife Coordination Act consultation with the U.S. Fish and Wildlife Service, Native American tribes consultation,



Arkansas Valley Conduit Web Site Home Page

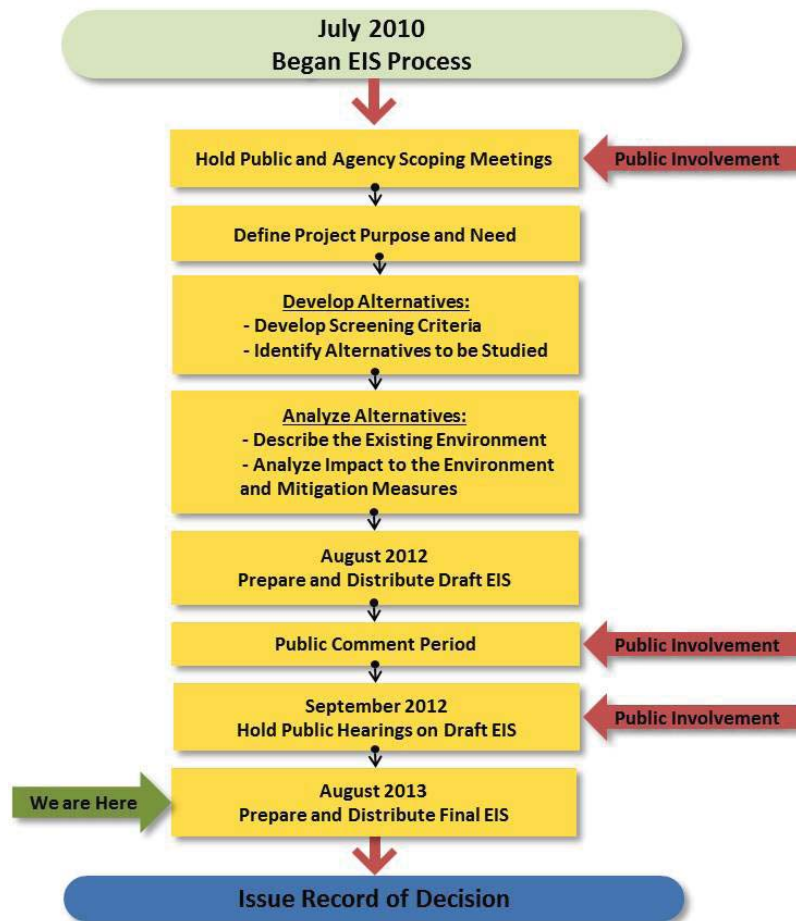
National Historic Preservation Act consultation with the Colorado State Historic Preservation Office and other consulting parties, and coordination and compliance with other applicable laws, regulations, and policies.

## Next Steps

No sooner than 30 days after the EPA has published the notice of availability for the Final EIS, Reclamation will issue a Record of Decision. The Record of Decision will identify the following:

- Significant comments received and issues raised in the Final EIS
- Reclamation's selected alternative for implementation
- Alternative(s) considered environmentally preferable

The Record of Decision will also discuss factors considered with respect to the alternatives and how these considerations entered into the decision. Reclamation will include environmental commitments, means to avoid or minimize environmental harm, and any monitoring or enforcement activities to ensure that environmental commitments would be met if proposed action(s) is/are selected, constructed, and put into operation.



*Dates in the timeline are approximate*

**Figure 16. Environmental Impact Statement Process**

# Abbreviations and Acronyms

AVC	Arkansas Valley Conduit
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
Fry-Ark	Fryingpan-Arkansas
Health Department	Colorado Department of Public Health and Environment
Interconnect	Pueblo Dam north-south outlet works interconnect
JUP	Joint Use Pipeline
Master Contract	long-term excess capacity master contract
NEPA	National Environmental Policy Act
OM&R	operation, maintenance, and replacement
Reclamation	Bureau of Reclamation
Southeastern	Southeastern Colorado Water Conservancy District

## Units of Measurement

ac-ft	acre-foot
cfs	cubic foot per second
mg/L	milligram per liter
pCi/L	picocurie per liter

Self Adhesive CD Sleeve  
Goes Here



The Bureau of Reclamation has prepared an Environmental Impact Statement for the Arkansas Valley Conduit, the Interconnect contract, and the Long-Term Excess Capacity Master Contract. The executive summary summarizes the document. The full document can be downloaded from <http://www.usbr.gov/avceis/>.

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## AVC EIS Region

